AF

Docket No.: 50432-293 (G0355)

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of	:	Customer Number: 20277
Cyrus E. TABERY, et al.	:	Confirmation Number: 1966
Application No.: 10/021,782	:	Group Art Unit: 2812
Filed: December 18, 2001	:	Examiner: S. Isaac

For: SCANNING LASER THERMAL ANNEALING

TRANSMITTAL OF APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Submitted herewith is Appellants' Appeal Brief in support of the Notice of Appeal filed February 4, 2005. The Appeal Brief fee is not required, as the fee was paid in a prior appeal in this application.

To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due under 37 C.F.R. §§ 1.17, 41.20, and in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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APPEAL BRIEF

Mail Stop Appeal Brief-Patents
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P.O. Box 1450
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Sir:

This Appeal Brief is submitted in support of the Notice of Appeal filed February 4, 2005, wherein Appellants appealed from the Examiner's rejection of claims 1 and 11.

I. REAL PARTY IN INTEREST

This application is assigned to Advanced Micro Devices, Inc., by assignment recorded on April 22, 2002, at Reel 012824, Frame 0329.

II. RELATED APPEALS AND INTERFERENCES

Appellants are unaware of any related appeals and interferences.

III. STATUS OF CLAIMS

Claims 1, 5-11, and 13 are pending in this Application. Claims 5-10 and 13 have been allowed. Claims 1 and 11 are finally rejected, and it is from the final rejection of claims 1 and 11 that this Appeal is taken.

IV. STATUS OF AMENDMENTS

An Amendment under 37 C.F.R. § 1.116 was filed on December 23, 2004, subsequent to the Final Office Action dated October 7, 2004. In an Advisory Action dated February 1, 2005, the Examiner indicated that the Amendment would be entered if an Appeal was taken. As an Appeal has been taken, Appellants proceed under the basis that the Amendment filed on December 23, 2004, was entered.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Independent claims 1 and 11 are the only independent claims, and each is directed to a method of manufacturing a semiconductor device in which source/drain regions are thermally annealed using a laser.

An issue associated with laser thermal annealing is that the fluence of a laser beam can vary, e.g., by as much as ± 5% (page 2 of Appellants' disclosure, lines 23-29). Fluence density can also vary across a spot area of a laser (page 2, line 30 through page 3, line 7). These variations can cause problematic overexposure of a substrate during laser thermal annealing, thereby disadvantageously overmelting source/drain regions. Underexposure of the source /drain regions is another problem

associated with variations in fluence. Accordingly, a need existed for an improved laser thermal anneal process that reduces fluence variation on a substrate (page 3, lines 5-7).

The method defined in each of independent claims 1 and 11 recites that a laser and substrate move relative to one another and each pulse from the laser respectively irradiates non-identical portions of the source/drain regions on the substrate, which is illustrated in Fig. 3. Thus, the substrate the laser does not dwell on a particular region, and an identical portion does not receive more than a single laser pulse. Independent claims 1 and 11 also recite that each portion of the source/drain region receives more than one single pulse of energy. This feature is also illustrated in Fig. 3 of Appellants' disclosure. By not dwelling at a single portion of the source/drain region yet exposing each discrete portion of the source/drain regions to several pulses, the variations in fluence between each pulse can be averaged out, which reduces the variance of total fluence provided to the source/drain regions (page 7, lines 23-30).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Claims 1 and 11 were rejected under 35 U.S.C. § 102 for anticipation based upon Yamazaki et al., U.S. Patent No. 6,242,292 (hereinafter Yamazaki).

VII. ARGUMENT

THE REJECTION OF CLAIMS 1 AND 11 UNDER 35 U.S.C. § 102 FOR ANTICIPATION BASED UPON YAMAZAKI

For the convenience of the Honorable Board in addressing this rejection, Appellants note that independent claim 11 stands or falls together with independent claim 1.

Independent claims 1 and 11 both recite that "each pulse from the laser respectively irradiates non-identical portions of the source/drain regions." This feature is illustrated, for example, in Fig. 3 of Appellants' disclosure, which shows pulses 1-5 impinging on non-identical portions of the substrate 100. Therefore, if the prior art teaches that an identical portion of a particular source/drain region is irradiated by two or more pulses, then this claimed limitation is not disclosed by the prior art.

In the Amendment filed June 22, 2004, and in the Amendment filed December 23, 2004, Appellants argued that Yamazaki fails to teach the above-reproduced claimed limitation. Specifically, Yamazaki teaches that an identical portion of a particular source/drain region is irradiated by two or more pulses. In this regard, Appellants specifically referred to column 7, lines 56-63 and column 2, lines 36-44 of Yamazaki, which are reproduced below:

> A two stage irradiation is performed. That is, irradiation of 150 to 300 mJ/cm^2 is performed as preliminary irradiation and then irradiation of 200 to 400 mJ/cm^2 is performed as main irradiation. The pulse width is 30 ns, and the number of pulses is 30 pulses/s. The two stage irradiation is performed to suppress deterioration of uniformity of the film surface due to the laser light irradiation at maximum and thus form a film having good crystallinity. (emphasis added) (column 7, lines 56-63)
>
> It has been known that, to moderate nonuniformity of the laser irradiation effect and improve its uniformity, it is better to preliminarily irradiate a weaker pulse laser light (hereinafter referred to as preliminary irradiation) before irradiation of an intense pulse laser light (hereinafter referred to as main irradiation). This effect is very high, and it can reduce the dispersion of the characteristics and thus remarkably improve the characteristics of a semiconductor device circuit. (emphasis added) (column 2, lines 56-63)

Yamazaki, therefore, teaches a "two stage irradiation" process in which a preliminary irradiation is followed by a main irradiation. Thus, each identical portion receives at least two pulses (i.e., a pulse from a preliminary irradiation and a pulse from a main irradiation). This teaching by Yamazaki cannot be reconciled with the limitations in claims 1 and 11 that recite

"each pulse from the laser respectively irradiates non-identical portions of the source/drain regions."

This argument was presented in the last full paragraph on page 8 of the Amendment filed June 22, 2004, the Examiner's "***Response to Arguments***". Although the Examiner did not directly address the above argument, Appellants note that the Examiner may have attempted to tangentially address this argument on page 13 of the Final Office Action when the Examiner stated:

> In addition, as stated by the Applicant's own admission of prior art, figure 2A, on page 7, lines 16-23, it is well known in the conventional art to expose to a single shot pulse of laser on the surface of the substrate, and then the laser is then moved to irradiate a separate portion of the surface. Therefore, it would be obvious to one of ordinary skill in the art to incorporate that each pulse or a single pulse would irradiate non-identical portions based on well known conventional techniques taught by Ino and by the Applicant's admission of prior art.

The limitation at issue (i.e., each pulse from the laser respectively irradiating non-identical portions of the source/drain regions), at the time the above statement was written, was found in the claims in which the Examiner rejected under 35 U.S.C. § 102 for anticipation. Thus, the Examiner's comment that it is "obvious to one of ordinary skill in the art to incorporate ..." is misplaced in a lack of novelty rejection and, to be proper, should have been presented in a rejection under 35 U.S.C. § 103 for obviousness.

Notwithstanding the Examiner's improper presentation of a obviousness-related argument to support a lack of novelty rejection, Appellants submits that the rejection of the claims under either 35 U.S.C. § 102 or 35 U.S.C. § 103 for obviousness is not viable. Although the Examiner asserts that it would have been obvious to one skilled in the art "to incorporate that each pulse

would irradiate non-identical portion," the Examiner's asserted motivation (i.e., "based on well known convention techniques") is, in fact, not a motivation to modify. Instead, the Examiner has merely employed an "obvious to try" argument, which has long been held by the Federal Circuit as being insufficient to establish the requisite motivation to modify a reference under 35 U.S.C. § 103.[1]

It has been repeatedly held by the Federal Circuit that in order to establish the requisite motivation, the Examiner must make "clear and particular" factual findings as to a specific understanding or specific technological principle which would have realistically impelled one having ordinary skill in the art to modify a particular prior art reference to arrive at the claimed invention based upon facts, not generalizations.[2] The Examiner's statement as to "well known conventional techniques" is nothing more than a generalization without any clear fact-based explanation as to why one having ordinary skill in the art would have modified the prior art to arrive at the claimed invention.

Furthermore, Yamazaki clearly teaches away from the claimed invention by advocating a two step irradiation, and this teaching away constitutes evidence of nonobviousness.[3] Moreover, if the proposed modification or combination of the prior art changes the principle of operation of

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[1] Obvious to try is not the standard. In re O'Farrell, 853 F.2d 894, 7 USPQ2d 1673 (Fed. Cir. 1988); In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Dow Chemical Co., 837 F.2d 469, 5 USPQ2d 1529 (Fed. Cir. 1988).

[2] Ruiz v. A.B. Chance Co., 234 F.3d 654, 57 USPQ2d 1161 (Fed. Cir. 2000); Ecolochem Inc. v. Southern California Edison, Co., 227 F.3d 1361, 56 USPQ2d 1065 (Fed. Cir. 2000); In re Kotzab, 217 F.3d 1365, 55 USPQ 1313 (Fed. Cir. 2000); In re Dembiczak, 175 F.3d 994, 50 USPQ2d 1614 (Fed. Cir. 1999).

[3] In re Bell, 991 F.2d 781, 26 USPQ2d 1529 (Fed. Cir. 1993), Specialty Composites v. Cabot Corp., 845 F.2d 981, 6 USPQ2d 1601 (Fed. Cir. 1988), In re Hedges, 783 F.2d 1038, 228 USPQ 685 (Fed. Cir. 1986), In re Marshall, 578 F.2d 301, 198 USPQ 344 (CCPA 1978).

the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious.[4] Since, as discussed above, Yamazaki clearly teaches that each portion of the semiconductor device receives at least two pulses (a pulse from a preliminary irradiation followed by a pulse from a main irradiation), one having ordinary skill in the art would not have arrived at the claimed invention based upon the teachings of Yamazaki.

Conclusion

Based upon the foregoing, Appellants submit that the Examiner's rejections under 35 U.S.C. § 102 is not factually or legally viable. Appellants, therefore, solicit the Honorable Board to reverse the Examiner's rejection under 35 U.S.C. § 102.

To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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[4] In re Ratti, 270 F.2d 810, 123 USPQ 349 (CCPA 1959); M.P.E.P. § 2143.03

VII. CLAIMS APPENDIX

1. A method of manufacturing a semiconductor device, comprising the steps of:

forming a gate electrode over a substrate;

introducing ions into the substrate to form source/drain regions in the substrate proximate to the gate electrode;

activating a portion of the source/drain regions by laser thermal annealing using a laser;

moving the laser and the substrate relative to one another; and

activating another portion of the source/drain regions by laser thermal annealing using the laser, wherein

each pulse from the laser respectively irradiates non-identical portions of the source/drain regions, and

each portion of the source/drain regions receives more than one single pulse of energy from the laser.

11. A method of manufacturing a semiconductor device, comprising the steps of:

forming a gate electrode over a substrate;

introducing ions into the substrate to form source/drain regions in the substrate proximate to the gate electrode;

activating a portion of the source/drain regions by laser thermal annealing using a pulse of laser energy from a laser;

moving the laser and the substrate relative to one another; and

activating another portion of the source/drain regions by laser thermal annealing using another pulse of laser energy from the laser,

wherein the laser and the substrate move relative to one another after each pulse of laser energy and each portion of the source/drain regions receives more than one single pulse of energy from the laser, and

each pulse from the laser respectively irradiates non-identical portions of the source/drain regions.